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## Caries Research

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1 Terminology of Erosive tooth wear: Consensus Report of a Workshop Organized by ORCA  
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59

60 **Abstract**

61 Our understanding of erosive tooth wear and its contributing factors has evolved  
62 considerably over the last decades. New terms have been introduced continuously to  
63 describe often the same aspects of this condition, whereas others are being used  
64 inappropriately. This has led to unnecessary confusion and miscommunication between  
65 patients, professionals and researchers. A group of 15 experts, selected by the European  
66 Organization for Caries Research and the Cariology Research Group of the International  
67 Association for Dental Research, participated in a two-day workshop to define the most  
68 commonly used terms in erosive tooth wear. A modified Delphi method was utilized to reach  
69 consensus. At least 80% agreement was achieved for all terms discussed and their  
70 definitions related to clinical conditions and processes, basic concepts, diagnosis, risk,  
71 prevention and management of erosive tooth wear. Use of the agreed terms will provide a  
72 better understanding of erosive tooth wear and intends to enable improved communication  
73 on this topic.

74

75 **Introduction**

76 Over the last decades, the topic of acid-related tooth destruction has been increasingly  
77 researched and reported more frequently in the literature. A simple PubMed search with the  
78 terms “dental erosion OR erosive tooth wear OR tooth erosion” revealed nearly 4000 hits,  
79 showing the general interest in this area. The major problem in this literature is that the  
80 terminology has evolved with variations in the meaning of a single term and sometimes  
81 different terms are used to describe the same condition. Therefore, this paper defines the  
82 most commonly used terms related to erosive tooth wear and its management. Use of a  
83 common terminology will facilitate less ambiguous communication between researchers,  
84 clinicians and their patients. It will also enable better documentation and interpretation of  
85 research findings and clinical observations.

86

87 **Methods**

88 The European Organization for Caries Research (ORCA) and the Cariology Research Group  
89 of the International Association for Dental Research (CRG-IADR) organized a consensus  
90 workshop on terminology related to erosive tooth wear and dental caries that was held in  
91 Frankfurt, Germany from 06-07 February in 2019. Two groups of experts were selected, one  
92 for caries and one for erosive tooth wear. This manuscript refers only to the results from the  
93 erosive tooth wear group.

94 Fifteen experts were selected by the executive boards of both organizations to participate in  
95 the erosive tooth wear section of the workshop, with NS and FL appointed as chairs. A draft  
96 document containing the most commonly used terms and their proposed definitions was  
97 prepared by NS and FL. Prior to the workshop, this document was circulated to the experts  
98 who independently decided on the appropriateness and accuracy of the provided statements.  
99 All individual feedback was collected and combined into one document by NS and FL, which  
100 was then shared among workshop participants. New terms and their definitions brought  
101 forward by the experts were also included in this document.

102 A modified Delphi process was used to establish the most commonly used terms and their  
103 definitions. The nominal group method was then used to reach consensus on each definition.  
104 Consensus with the final definitions or statements was ascertained by anonymous voting.  
105 Each term and its definition were voted on separately. An agreement of at least 80% was  
106 needed to confirm the definition and/or statement for each term. The reached agreement in  
107 percent is given after each term in parentheses.

108 The terms and their definitions are presented in the following categories: clinical conditions  
109 and processes, basic concepts, diagnosis, risk, and prevention and management of erosive  
110 tooth wear. In addition to some of the definitions, further explanations are given in *italics*. In  
111 these cases, the percentage of agreement also refers to these additional explanations. For

112 this paper, the term 'mineralized tooth substance' refers to dental enamel, dentine and  
113 cementum.

114

## 115 **Terms and definitions**

### 116 **1. Clinical conditions and processes**

#### 117 a) Conditions

##### 118 Tooth wear (100%)

119 The cumulative surface loss of mineralized tooth substance due to physical or chemo-  
120 physical processes (dental erosion, attrition, abrasion).

121 *Tooth wear is not considered to be the result of dental caries, resorption or trauma.*

122

##### 123 Erosive tooth wear (100%)

124 Erosive tooth wear is tooth wear with dental erosion as the primary aetiological factor.

125

#### 126 b) Processes

##### 127 Dental Erosion (100%)

128 Dental erosion is the chemical loss of mineralized tooth substance caused by the exposure  
129 to acids not derived from oral bacteria.

130

##### 131 Dental Attrition (100%)

132 Dental attrition is the physical loss of mineralized tooth substance caused by tooth-to-tooth  
133 contact.

134

##### 135 Dental Abrasion (100%)

136 Dental abrasion is the physical loss of mineralized tooth substance caused by objects other  
137 than teeth.

138

#### 139 c) Discouraged terms

##### 140 Demastication (100%)

141 The term demastication is discouraged and will not be defined in this publication.

142

##### 143 Abfraction (100%)

144 The term abfraction is discouraged and will not be defined in this publication. The level of  
145 evidence currently available is too weak to justify it as a separate process.

146

##### 147 Acid erosion/acidic erosion (93%)

148 The terms acid erosion and acidic erosion have the same meaning as dental erosion, are  
149 discouraged and will not be defined in this publication.

150

151 Tooth surface loss (100%)

152 The term tooth surface loss has been used to describe tooth wear. Its use is discouraged in  
153 the clinical situation and will be defined in the context of research outcome measures.

154

## 155 **2. Basic concepts**

156 Erosive challenge (100%)

157 Exposure to an acid, which may lead to an erosive demineralization.

158

159 Erosive demineralization (100%)

160 Loss of tooth mineral caused by exposure to acids resulting in an erosive lesion.

161

162 Resistance to dental erosion (100%)

163 The capability of the mineralized tooth substance to withstand an erosive challenge.

164

165 Protection against dental erosion (100%)

166 Any measure, which increases the resistance of the mineralized tooth substance to dental  
167 erosion, prevents exposure to or limits the effect of an erosive challenge.

168

169 Remineralization (87%)

170 Recovery of the original mineral phase of the tooth substance after demineralization

171 *There is insufficient evidence that remineralization in dental erosion occurs; however, surface*  
172 *deposition of mineral may be possible.*

173

174 Erosive potential/erosivity (100%)

175 The capability to cause dental erosion.

176 *The erosive potential of a substance depends on several factors such as its pH and buffering*  
177 *properties, calcium and phosphate contents (degree of saturation), fluoride content, and*  
178 *temperature. Whether the erosive potential translates into dental erosion depends on host*  
179 *factors and exposure conditions.*

180

181 Buffering properties (100%)

182 Buffering properties of an aqueous solution are a measure of resistance to pH change, and  
183 can be represented by:



- 184 - Titratable acidity: the amount of base, given in mmol/l, needed to raise the pH to a  
185 defined level (normally 7.0).  
186 - Buffering capacity: the buffering at the pH of the investigated solution. It can be  
187 assessed from the slope of the titration curve at the solution pH.

188

189 Abrasive potential/abrasivity (100%)

190 The capability to cause dental abrasion.

191

192 Endogenous/intrinsic acids (87%)

193 Acids from the gastric juice.

194

195 Exogenous/extrinsic acids (93%)

196 Acids from external sources, such as the diet, environment and/or drugs.

197

198 Laboratory terms (93%)

- 199 - Sound tooth surface

200 A tooth surface without any recognizable defect.

- 201 - Initial (early) erosive lesion

202 A lesion with mineral loss without surface loss.

- 203 - Advanced erosive lesion

204 A lesion with mineral loss together with surface loss.

205

206 Discouraged terms

207 Corrosive wear, bio-corrosion (100%)

208 The terms corrosive wear and bio-corrosion are discouraged and will not be defined in this  
209 publication.

210

### 211 **3. Diagnosis**

212 Diagnosis of erosive tooth wear integrates findings from the patient history, assessment of  
213 risk factors and an oral examination. (100%)

214 Typical early signs of erosive tooth wear include defects that are shallow; they mostly affect  
215 the smooth surfaces and the area coronal to the cemento-enamel junction with an intact  
216 band at the gingival margin. On the occlusal surfaces, cupping and flattening of the surface  
217 can be found. As erosive tooth wear progresses, the dentine colour becomes more visible  
218 and restorations may protrude from the surrounding dental hard tissue. Finally, the teeth can  
219 have a melted appearance losing the morphology of sound teeth. (93%)

220

221 Physiological tooth wear (87%)  
222 Some degree of tooth wear expected over a lifetime.  
223 The rate of progression varies between individuals and not all tooth wear needs treatment.  
224  
225 Pathological tooth wear (93%)  
226 Tooth wear can be defined as pathological if it is beyond the physiological level relative to the  
227 individual's age and interferes with the self-perception of well-being.  
228  
229 Classification (100%)  
230 - Mild erosive tooth wear (BEWE 1)  
231 Initial loss of surface texture  
232 - Moderate erosive tooth wear (BEWE 2)  
233 Distinct defect: hard tissue loss involving less than 50% of the surface area  
234 - Severe erosive tooth wear (BEWE 3)  
235 Hard tissue loss involving more than 50% of the surface area  
236 Moderate and severe levels may involve dentine exposure.  
237  
238 Distribution of erosive tooth wear (87%)  
239 Localized erosive tooth wear is restricted to a few teeth.  
240 Generalized erosive tooth wear involves most of the teeth.  
241  
242 Discouraged term  
243 Activity of erosive tooth wear (100%)  
244 As activity refers to disease, this term is discouraged and will not be defined in this  
245 publication.  
246  
247 **4. Risk**  
248 Erosive tooth wear risk (87%)  
249 The probability that erosive tooth wear will occur within a defined period of time or at a  
250 certain age.  
251  
252 Risk factor/predisposing factor for erosive tooth wear (100%)  
253 A risk factor or predisposing factor is any aspect of personal life-style, habit, or behaviour,  
254 medical condition, environmental exposure or an inborn or inherited characteristic, which is  
255 evidentially associated with an increased probability to develop erosive tooth wear. Risk  
256 factors are a part of the causal chain or expose the individual to the causal chain.  
257

258 Variable/modifiable risk factor (93%)

259 The risk factor can be modified by an intervention, which in turn can reduce the likelihood to  
260 develop erosive tooth wear.

261

262 Risk marker/risk indicator (100%)

263 An attribute or exposure that is associated with an increased probability of developing  
264 erosive tooth wear, but not thought to be a part of the causal chain (e.g. some evidence  
265 showing that erosive tooth wear in the primary dentition is a risk marker for erosive tooth  
266 wear in the permanent dentition).

267

268 Risk assessment for erosive tooth wear (100%)

269 Risk assessment comprises the qualitative and quantitative estimation of the likelihood of  
270 developing erosive tooth wear. It uses clinical, epidemiologic, environmental, and other  
271 relevant data.

272 Screening for erosive tooth wear is the first step of risk assessment – if indicated next steps  
273 would be:

- 274 - Risk factor identification and characterization
- 275 - Exposure assessment
- 276 - Risk estimation (combining the above to quantify risk level)

277

278 Risk management of erosive tooth wear (100%)

279 Risk management includes various steps to reduce the level of risk, which are a) risk  
280 evaluation; b) exposure control, c) risk monitoring. In case of erosive tooth wear, it comprises  
281 the analysis of which type of wear leads to the hard tissue loss, reduction of acid exposure  
282 and exposure to physical forces and the check, whether recommendations are sustainably  
283 realized in the daily practice.

284

## 285 **5. Prevention and management of erosive tooth wear**

286 Management is the complete scope of care and self-care including diagnosis, risk  
287 assessment, prevention (primary, secondary, tertiary) and monitoring of erosive tooth wear.  
288 (100%)

289

290 Prevention of erosive tooth wear

- 291 - Primary Prevention (93%)

292 Primary prevention involves general/non-personalized advice about risk factors and  
293 can include population-based measures to prevent erosive tooth wear.

- 294 - Secondary Prevention (100%)

295           Following diagnosis, secondary prevention involves non-restorative treatment of  
296           erosive tooth wear, including personalized advice, and when appropriate liaison with  
297           other healthcare professionals.

298       - Tertiary Prevention (80%)

299           In addition to secondary prevention, restorative treatment strategies may be  
300           considered in tertiary prevention.

301

302   Erosive tooth wear monitoring (100%)

303   Regular assessment of erosive tooth wear status tailored to the patient's needs.

304

305   The consensus workshop participants recommend to continuously review the discussed  
306   terminology every five years or sooner if new terms arise that require clarification.

307

308   The attached references were considered by the workshop participants in the selections of  
309   the discussed terms and their definitions.

310

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316

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